

2-6 Algebraic Proof

Properties of Equality

Addition Property--If $a = b$ and $c = d$, then $a + c = b + d$.

Subtraction Property--If $a = b$ and $c = d$, then $a - c = b - d$.

Multiplication Property--If $a = b$, then $c \cdot a = c \cdot b$.

Division Property-- If $a = b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$

Distributive Property-- $a(b + c) = ab + ac$

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Substitution Property--If $a = b$, then either a or b may be substituted for the other in any equation.

"combine like terms"

Reflexive Property-- $a = a$

Symmetric Property--If $a = b$, then $b = a$.

Transitive Property--If $a = b$ and $b = c$, then $a = c$.

Reflexive, symmetric, and transitive also work with congruence.

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Example 1	
Statements	Reasons
1. $8(x - 5) = 32$	1. Given
2. $8x - 40 = 32$	2. Distributive
3. $8x - 40 + 40 = 32 + 40$	3. Addition
4. $8x = 72$	4. Substitution
5. $\frac{8x}{8} = \frac{72}{8}$	5. Division
6. $x = 9$	6. Substitution

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Example 1	
1. $8(x - 5) = 32$	1. Given
2. $8x - 40 = 32$	2. Distr.
3. $8x = 72$	3. Add.
4. $x = 9$	4. Div.

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Example 2

1. $5x - 3 = 12$

2. $5x = 15$

3. $x = 3$


1. Given

2. Add.

3. Div.

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Example 3

1. $8x + 3x - 9 = 24$


2. $11x - 9 = 24$

3. $11x = 33$

4. $x = 3$

1. Given

2. Subst.

3. Add.

4. Div.

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Example 4

1. $2(5 - 3x) - 4(x + 7) = 92$

2. $10 - 6x - 4x - 28 = 92$

3. $-10x - 18 = 92$

4. $-10x = 110$

5. $x = -11$

6. $-11 = x$

1. Given
2. Dist.
3. Subst.
4. Add
5. Div
6. Symmetric

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Justify each statement.

1. Reflexive $m \angle 1 = m \angle 1$
2. Add. If $m \angle 1 = m \angle 2$, then $m \angle 1 + m \angle 3 = m \angle 2 + m \angle 3$
3. Mult. If $AB = CD$, then $2 \cdot AB = 2 \cdot CD$.
4. Symm. If $RS = XY$, then $XY = RS$
5. Transitive If $m \angle A = m \angle B$, and $m \angle B = m \angle C$, then $m \angle A = m \angle C$
6. Division If $m \angle 1 = 90$, then $m \angle 1 = 45$
7. subst. If $m \angle 9 + m \angle 10 = 150^\circ$, and the $m \angle 10 = 48^\circ$, then $m \angle 9 + 48 = 150$.
8. subtr. If $m \angle 9 + 48 = 150$, then $m \angle 9 = 102$.

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$$5 - \frac{2}{3}x = 1$$

$$3(5 - \frac{2}{3}x) = 3(1) \quad \text{Mult.}$$

$$15 - 2x = 3$$

$$\text{d. } -2x = -12$$

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Hw

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